DOWNLOAD PDF UF0D8/TWHAT ROLE DOES THE ELECTRIFICATION PLAY IN THE LARGER REALM OF NATIONAL DEVELOPMENT?

Chapter 1 : Project MUSE - Reconstructing the Archipelago

electrification play in the larger realm of national development? In an effort to answer these questions, and learn more about the electricity sector in Uganda generally, I pursued research with specific objectives in mind.

In lieu of an abstract, here is a brief excerpt of the content: This currency decline did not cause an immediate mass panic, as the central government in Jakarta assured the public that the country, with its strong economic foundations, would not enter into a crisis. But, alas, the rupiah went into free fall only a few weeks later. Within several months the whole country was in deep turmoil, triggered by the unforgiving Asian financial crisis that had struck the whole region. Indonesia suffered the most, and its crisis entailed unpredictable political ramifications. Amid riots that saw parts of Jakarta burn, on 21 May , President Suharto, the strongman of the authoritarian New Order regime, finally stepped down after ruling Indonesia for thirty-two years. This dramatic episode in Indonesian politics marked the start of the era of Reformasi, which paved the path to democracy. Twenty years after being prostrated by turbulence in the global financial system, Indonesia is now emerging as a new economic powerhouse in Asia, having undergone massive transformations from what it had been under the New Order regime. Currently, Indonesia is the largest economy in Southeast Asia. Reformasi created a new sociopolitical environment whereby democratic principles became the rules of the game. For several years, democratic transitions brought about a wholesale change in the political landscape that took place from the central government in Jakarta all the way down to the district level countrywide. The authoritarian top-down style of governance is now a thing of the past, as liberal democracy is widely embraced. Having implemented political reforms, Indonesia now has one of the most complex electoral systems seen anywhere, in which all executive officers from the president and provincial governors down to district heads are elected through general elections. This renders Indonesia the third most populous democracy in the world after India and the United States. It is such complexity that attracts interested scholars to study how these massive social and political transformations have been carried out in response to the postâ€”New Order environment. Indeed, explaining a country like Indonesia is not an easy job for any scholar to accomplish. The country is extremely largeâ€”the archipelago stretches for some 5, km, the same distance as New York to Anchorage, and is made up of around 17, islands, half of which are uninhabited. A culturally diverse nation, Indonesia has over two hundred ethnic groups living across the archipelago, each with its own language but all speaking a common language, Bahasa Indonesia. As a postcolonial nation, Indonesia as such did not exist before the Dutch came to the archipelago and claimed it as a colony. During the precolonial period, for centuries a number of major kingdoms ruled parts of what is now Indonesia. Under the Dutch rule modernity was introduced, and in the twentieth century the European concept of the nation-state was adopted by pro-independence movements that called for unity among all the peoples of the archipelago. The study of modern Indonesia was pioneered by Western scholars intrigued by its history and culture. More specifically, the beginnings of this academic field saw a growing interest among American scholars who paid particular attention to revolution and nationalism, a political process that dates back to the late nineteenth You are not currently authenticated. View freely available titles:

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development goals, particularly in the realm of cooking, women are critical partners. They have a role in clean cooking value chains - from design, production, distribution and sales, to after-.

Roughly half of the energy supply goes into the production of electricity. Of that, the largest share is provided by coal, which has the worst GHG intensity of the supplies and is the cheapest and fastest way to increase supply in developing economies. By contrast, essentially all of the renewable and zero-emission supplies also go into electricity production, but these account for a tiny fraction of the energy mix. Wilson, The Future of the Electric Grid: A View to , Sacramento Page 24 Share Cite Suggested Citation: Computing Research for Sustainability. The National Academies Press. Roughly half of the quads 10 15 Btu is lost, most coal goes to electricity, electricity goes almost equally to residential buildings, commercial buildings, and industrial processes. Lawrence Livermore National Laboratory Doing so will dramatically change the nature of the supply, however, since the availability of these resources varies with natural factors, such as wind and sun, rather than being dispatched as needed to meet demand. Furthermore, the geographic placement of these supplies is governed by natural factors, and so the points at which they attach to the grid, and therefore the pattern of flow from supply to demand and hence the power lines, stations, and devices used to convey these flows of electricity, may be quite different from the flows associated with traditional power plants. This has implications for IT, since the information-management problem for distributed energy production is fundamentally different from that for more centralized production. Managing electricity produced by a half million windmills requires advanced ITâ€”data management, algorithms, and analyticsâ€”whereas managing a few hundred coal-fired power plants is a much simpler proposition from an IT perspective. Already a significant fraction of the supply in the U. Moreover, reducing the GHG emissions associated with transportation and industrial processes, which are currently dominated Page 25 Share Cite Suggested Citation: Major efficiency gains, the accommodation of variable supplies, and electrification are all likely to involve change in the patterns and practices of the institutions and individuals that represent the demand, which in large part rests on access to actionable information. Innovation in IT and its use underlie all aspects of such a transformation, as described below. Electric grids can be characterized by their key components: Typically, each of these components has been addressed in isolation. Whereas other disciplines will contribute primarily to the advance of the physical components comprising the elements of the energy supply chain, IT is expected to govern how these elements behave and how the complex system as a whole functionsâ€”that is, what properties it exhibits. The section below first describes several challenges presented by smart grids and then outlines approaches to addressing these challenges, especially from an IT perspective. Finally, a discussion of the specific role of computer science research and innovation in IT is offered. Challenges for the Modern Electric Grid Four main challenges for the modern electric grid are discussed below: Increased Consumption Increased productivity and improved standards of living correlate closely with increased energy consumption. Even in the United States, where the energy-to-gross domestic product GDP ratio has been steadily improving through technological improvements and efficiency measures, especially since the oil crisis in , overall energy consumption continues to increase. This is an especially serious problem in recently industrialized nations, such as China. Continuing increases in consumption pose multiple challenges. Page 26 Share Cite Suggested Citation: This trend further compounds the GHG emission problem. Lower-carbon options, such as nuclear power, present other hazards, and renewable sources cannot typically be dispatched on demand, impose other environmental impacts, or are remote from areas of dense consumption. Wasteful production and manufacturing practices, especially in newly industrialized or rapidly growing economies, further compound the climate impact. IT cannot provide generation, but it can enable more effective use of generation facilities to meet increased demand, facilitate the shift toward more desirable supplies, and help manage the increasing demand. In addition to providing adequate supply to meet growing demandâ€”which clearly cannot continue indefinitelyâ€”it must be possible to deliver the generated energy through the transmission grid and distribution tree reliably and safely. Each power line and each piece of electrical equipment has limited capacity and lifetime. Instead, the amount of power is determined implicitly, by the underlying physics associated with a distributed collection of loads, connected to a differently distributed collection of generators, through a particular interconnection of wires and transformers. Individual consumers decide independently how much to draw at each load point, and a centralized system operator orchestrates the production at each of the generators in order to match the supply to the demand in real time within the capacity limits of each line and transformer, and within emissions limits set for each generator. This constrained optimization problem is relatively tractable if the transmission and distribution infrastructure is sufficiently overprovisioned. But, as more of its capacity is demanded, the problem becomes substantially more difficult. A network of communicating sensors is overlaid onto the grid to monitor its distributed state, and sophisticated algorithms are used to predict demand, model the flows, schedule generation, and adjust the limited set of control points that are present. This increases the resistance of the line, causing it to heat further, and increases parasitic losses due to capacitance to the ground, which increases demand. All of these factors contribute to failures, which eliminate portions of the transmission or distribution infrastructure and thereby place potentially excessive demand on remaining portions. Page 27 Share Cite Suggested Citation: These challenges are further complicated by the changing nature of the load and the broader introduction of distributed generation. Unlike purely resistive loads, such as heating elements and incandescent bulbs, complex loads effectively cause a portion of the delivered power called reactive power to be returned through the grid to the generator. But switching power supplies, such as those used in computers, fluorescent bulbs, battery chargers, and electronics direct current DC adapters, introduce complex distortions on the AC waveforms. Residential grid-tie solar installations reverse the flow of electricity within portions of the local distribution tree. And the introduction of electric vehicles potentially introduces high point loads during recharging. Compounding all of these issues still further are the economic structures that impinge on all aspects of generation, delivery, and demand at a range of timescales. On an operational basis, collections of suppliers, consumers, and brokers typically participate in highly volatile wholesale energy markets at various granularities and timescalesâ€”a day ahead, an hour ahead, a minute ahead. Meanwhile, consumers typically experience relatively stable retail pricing. Compounding all of these issues further, utilities and the utility supply industry are still largely incentivized to produce and deliver more energy, not less. Economic or other incentives to curb growth are lacking in most parts of the world. A notable exception to this is net-meteringâ€”mechanisms that allow electricity consumers to offset their usage of electricity provided by the grid, and thus to lower their cost, by generating their own electricity on-site, typically through rooftop solar photovoltaic installation. Basically, this can be thought of as the meter spinning backward when local generation exceeds local demand. Although net-metering is comparatively common, its penetration is modest enough that it can be incorporated as offsetting demand in the neighborhood distribution tree, without appreciable impact on transmission needs. Broader, less-tangible incentives include the personal satisfaction of obtaining a zero-net lifestyle, potentially opening paths toward the decoupling of quality of life from energy usage. IT has an important role in doing the complex accounting and providing visibility into the consumption and production of otherwise invisible resources. Page 28 Share Cite Suggested Citation: Of course, the demand is not specified explicitly, but implicitly in the use of electricity. Typically, independent service operators perform day-ahead demand prediction for their entire grid, with hour-ahead and even minutes-ahead adjustments, to drive scheduling and market mechanisms while providing adequate generation capacity at all specific points in the transmission grid over time. An imperfect matching of supply to demand manifests in degraded power quality such as voltage sags or surges, and frequency variation. Challenges include the following: Since generation and transmission capabilities must be built out to meet the peak demand, this peak drives overall investment. However, because there is significant variation in demand, a substantial portion of this investment experiences very low utilization. Fundamentally, load following relies on statistical multiplexing of independent loads; even though the individual loads are very bursty, the aggregate of many such loads is relatively smooth and predictable. However, correlations in the loads, such as air conditioning on hot summer afternoons or refrigerator compressor cycles at breaks in Superbowl action, generate very large aggregate peak demand. Means of power generation with short ramp-up times tend to have low efficiency and high GHG emissions and operating costs. A mismatch of predicted and actual demand leads to large and rapid fluctuations in wholesale energy prices. Each new broad-based usage change for example, the increased uptake of plasma television sets, compact fluorescent lamps, electric vehicles, and so on raises concerns of prediction accuracy. Paradoxically, by eliminating waste, energy-efficiency measures can lead to larger peak-to-average ratios and potentially lower prediction accuracy, making the grid harder to manage. Grid-level storage exists in the form of pumped-storage hydroelectricity compressed air, thermal energy storage, batteries, and a few other possibilities, but storage capacities remain limited. Storage is typically expensive, and turnaround efficiencies the energy extracted from storage relative to the amount stored tend to be low. Small-scale battery storage is prevalent but expensive, and the number of Page 29 Share Cite Suggested Citation: When the effects of manufacturing and the disposal of batteries are taken into account, such storage may have a net negative environmental impact. Most renewable sources of energy, such as wind, solar, and wave, are non-dispatchable. That is, they are available only at certain times and in magnitudes determined by various environmental factors; they cannot be summoned on demand. Gross features, such as the incident solar radiation over the course of the day or the seasonal patterns in wind, are much more predictable than fine features, such as occlusion due to passing clouds or gusts and lulls, and the latter can cause very rapid changes in supply. Much of the growth of power generation in highly industrialized nations in recent years is in renewable supplies. But the penetration of those sources is fundamentally limited in a load-following regime i. Many smart grid proposals focus on increasing the capacity and sophistication of the transmission system to reduce constraints imposed by transmission in matching supply to demand. These include longdistance lines, in many cases using high-voltage DC, in order to access remote renewable supplies both for increased availability and to obtain geographic decorrelation. Within a grid, especially with distributed renewable resources, there may be sufficient supply to serve the load but inadequate capacity to route the power from points of generation to points of use. Better prediction, monitoring, and scheduling seek to prevent such bottlenecks. Their use enables more accurate prediction and more effective scheduling as well as introducing incentives, such as time-of-use pricing or critical peak pricing, to nudge the demand toward a more grid-friendly form. These efforts introduce a degree of observability into this complex system and thus open the way to decision making and action. As the IT in the grid evolves to embody monitoring, communication, embedded processing, and intelligence at various levels of the grid, it can provide a foundation for an interactive relationship between supply and demand that increases the penetration limit for renewable sources. See, for instance, http: Page 30 Share Cite Suggested Citation:

Chapter 3 : Austria-Hungary - Wikipedia

The more positive view of the role of rural electrification and its relation to poverty reduction has interesting implications for rural development strategies as a whole. Most people living in poverty are in rural areas living below the poverty line (70% in rural as opposed to 30% in urban areas).

Personal use only; commercial use is strictly prohibited for details see Privacy Policy and Legal Notice. Mass Transit in 19th- and 20th-Century Urban America Summary and Keywords Mass transit has been part of the urban scene in the United States since the early 19th century. Regular steam ferry service began in New York City in the early s and horse-drawn omnibuses plied city streets starting in the late s. Expanding networks of horse railways emerged by the midth century. The electric streetcar became the dominant mass transit vehicle a half century later. During this era, mass transit had a significant impact on American urban development. In the s, congressional subsidies began to reinvigorate mass transit and heavy-rail systems opened in several cities, followed by light rail systems in several others in the next decades. Today concerns about environmental sustainability and urban revitalization have stimulated renewed interest in the benefits of mass transit. Regular steam ferry service connected Brooklyn and New Jersey to Manhattan in the early s and horse-drawn omnibuses plied city streets starting in the late s. A half century later, technological innovation and urban industrialization enabled the electric streetcar to become the dominant mass transit vehicle. During this era, mass transit had a significant impact on American urban development, suburbanization, the rise of technological networks, consumerism, and even race and gender relations. In the s, when congressional subsidies began to reinvigorate mass transit, heavy-rail systems opened in cities such as San Francisco and Washington D. As the 21st century approached, concern about environmental sustainability and urban revitalization stimulated renewed interest in the benefits of mass transit. Transit history in American cities is rooted in different phases of urbanization, the rise of large corporate entities during the industrial era, the relationship between technology and society, and other broad themes within American history. At the same time, mass transit history shows the value of emphasizing local contexts, as the details of urban transit unfolded differently across the United States based on municipal traditions, environments, economies, and phases of growth. Ferry Boats, Omnibuses, and the Beginnings of Mass Transit in the Early 19th Century The ferry boats that regularly crossed the waters of a few American cities in the early 19th century provided an important precedent to the mass transit industry that emerged later in the century. Before the age of industrialization, the cities of the American merchant economy were primarily sites of commercial exchange of goods and services. Boston, New York, Philadelphia, and most other urban centers were dense, port cities located along rivers, bays, and other bodies of water. And while this geography facilitated the transshipment of goods, it also impeded the expansion of urban settlement. During the early s, Robert Fulton, an engineer and inventor, established a regular ferry service using steam power. The service linked lower Manhattan with Jersey City over the Hudson River, as well as the village of Brooklyn , at the time a small suburban settlement across the East River. Ferries also demonstrate the early connections between transit and urban expansion, as the service allowed commuters living in areas such as the newly subdivided Brooklyn Heights neighborhood to overcome obstacles for continuous settlement posed by bodies of water. Typically, regular users of this service enjoyed above-average incomes and social positions. Unlike most working people, they could afford the expense of a daily fare. Thirteen companies employed seventy steamboats for more than twenty different ferry routes. Ferry service is still an integral part of daily commuting in some cities today. Despite its success, however, ferry boat service could do little to improve transportation over land. This operationâ€"a large horse-drawn wheeled carriage similar to a stagecoach yet open for service to the general public at a set fareâ€"originated in Nantes, France, in Omnibus service spread to Paris two years later and to other French cities as well as London by It spread from larger to smaller cities in subsequent decades. Since most vehicles featured unpadded seats and typically travelled on uneven cobblestone roads if paved at all , passengers experienced an uncomfortable ride. This growing demographic found private stagecoaches too expensive, but they had the affluence and desire to commute to work instead of walking. Horse streetcarsâ€"commonly known as horsecars â€"traveled on rail instead of road, and had numerous advantages over the omnibus. The use of rails provided a faster, quieter, more comfortable ride, while enabling a more efficient use of horse power. This fact allowed for larger cars that carried approximately three times as many riders as the omnibus. Following a slow start, other American cities adopted horsecars by the s, part of the wider context of rampant urbanization during the second half of the 19th century. Typically, a private company ran lines under a franchise awarded by the municipality that outlined the public roads on which the company could build rails and operate routes, along with other stipulations. Further expansion developed during the s. The franchise owners, including banker John Mason, intended the line to serve as the first stage of a passenger steam railway linking lower Manhattan to Harlem. However, fears of noise, smoke, and boiler explosions from those living along the right-of-way prompted the city to prohibit the railroad from operating steam engines within the built-up area south of Twenty-Seventh Street, so the company relied upon horse power within the restricted area. This phenomenon reinforced the value of local contexts, as horsecar lines developed differently in each city based on factors such as local politics, geography, and population density. Horsecarsâ€"and the rails upon which they travelledâ€"began a process of redefining the meaning of city streets that continued with electric streetcars and automobiles. The street became more a place for mobility, diminishing the centrality of sociability, recreation, and other traditional street uses. Initially, popular sentiment opposed the placement of rails along streets, especially since rails were not flush with the street surface and impeded cross movement until the invention of grooved rails in That same year, New York saw its first horsecar operation distinct from steam railroads, and the service soon spread to many other American locales. Ironically, steam power, an essential component of the first Industrial Revolution, created a greater demand for this older form of energy in industrial cities. Horses were expensive to maintain. They ate their value in feed each year, required large stables and care from veterinarians, stablehands, and blacksmiths, and their average work life lasted less than five years. And once horses met their ultimate fate, their bodies had to be removed. New York alone disposed of fifteen thousand horse carcasses annually. Thousands of horses died during the epidemic, which created operational upheaval for the horsecar industry. Not surprisingly, the event further reinforced the need for cheaper, more reliable forms of transit power. It had provided power for ferry services since the s and passenger railways two decades later. By the midth century, commuter railways using steam locomotives essentially short-haul passenger rail connected affluent residents living in small suburban areas to places of work and entertainment in large cities. Many city dwellers living along crowded streets considered the noise, pollution, and other dangers associated with the technology to be nuisances. Steam operation also generally cost more than horse power until the s. A few New York companies gambled on steam-powered conveyances during the s, but they all soon ceased their experiments. This proved to be among the earliest forms of rapid transit, since vehicles operated on their own right-of-way, not in mixed traffic. Once electricity became a possible power source by the s, city dwellers clamored for rapid transit to burrow underground. Power generated from a stationary central sourceâ€"rather than within a moving locomotiveâ€"offered another alternative. Cable cars traveled on rail, similar to horsecars and steam railways, but these vehicles clasped on a moving cable within a street conduit. This feature eliminated much of the noise, smoke, and danger of boiler explosions that plagued urban steam locomotives although such nuisances were still present at the stationary power source. Cables had advantages over horse power, but they also carried particular weaknesses. Cables were always under the threat of snapping. Maintenance and replacement constituted a complex, expensive process that negatively affected service. Ice buildup produced issues in colder cities. The cable had to run at the same capacity no matter the service level, which meant power generation could not diminish at off-peak times. But numbers declined soon after electric streetcar operation became practical in the s. By , only twenty miles of cable car track were still in use. Transit Becomes Electric Technological innovations, demand from the transit industry for improved operations, and a desire for mobility enabled the electric streetcar to become the dominant mass transit vehicle in the United States by the turn of the 20th century. Experiments with battery power also failed in terms of feasible, everyday operation. Rather, as transit historian Brian J. Twelve years later, 90 percent of all streetcars in the United States relied on his patents, and few horsecars were still in operation. Often, they used existing rails and even former horsecar vehicles. New forms of expertise related to electricity replaced veterinarians, blacksmiths, and other horse-related professions. The new technology also generated mergers with large companies swallowing up smaller enterprises, monopolizing service in urban areas, and employing corporate business forms in order to raise capital needed for investment in electricity infrastructure in some cases, electrical utility companies were also transit providers. Transit remained within the private market in most American cities until the second half of the 20th century, but the organizational structure of the industry became more complex. Like horsecars decades earlier, electric streetcars accommodated heavier passenger loads compared to predecessors. This reduced passenger cost per mile, lowered fares, and stimulated greater transit use by wider segments of society. The London Underground had operated steam-powered trains when it opened in , but most commentators believed Americans would avoid smoke-filled subway tunnels. The massive construction cost also impeded subway building. In , the Massachusetts legislature authorized Boston to build the first subway in the United States. The line, which was completed four years later, buried 1. The Boston Transit Commission, a public body, financed construction, while the private West End Street Railway operated the line and serviced its debt. In many cases, the technology exacerbated trends that began with the horsecar. In essence, this entailed the general separation between major commercial activities in the downtown and districts of residence and other activities, such as manufacturing, in less dense areas surrounding the core and along the urban fringe. The American walking cityâ€"in which the dominant mode for the journey to work was by footâ€"came to an end, although many workers still walked to their places of employment. The many streetcar lines that radiated from central business districts across the United States increased accessibility to and from downtown. Electric traction had a centralizing effect by increasing land values in the core and creating the economy of large buildings and places of entertainment during the late 19th and early 20th centuries. These attractions relied upon other technologies such as the elevator, telephone, and electric light, yet the rise of skyscrapers and other iconic elements of the modern urban landscape would have been unlikely without streetcars. Unlike the natural limits of horsecars, electric streetcars could journey well beyond the existing city once trackage was laid. In Boston, for example, the area of urban settlement expanded from two miles outside the old walking city core during the horsecar era to four miles during the first decade of electric streetcar service. Those who worked within the older city but could not afford the daily ten-cent round trip fare were forced to stay or walk long distances from the urban fringe. For example, accessible, cheap land enabled suburban residential developments of semi-detached or detached dwellings set back from the street and surrounded by a yard apartments also existed. Walkability remained important for at least some daily tasks and, of course, for the journey to the nearby streetcar stop. Thus, on the whole, streetcar suburbs had fairly compact forms and high population densities compared to the automobile-centric suburbs that developed later in the 20th century, although such forms and densities varied based on local influences, levels of affluence, and other factors. Real estate speculators knew the value of streetcar service to their developments. In many cases, transit companies held real estate interests along the urban fringe, which they connected via streetcar to spur development, even if the line itself was unprofitable. Yet the many streetcar suburbs that still dot the American landscape today were not simply the result of ambitious developers, but also the desires and actions of many people, from local politicians to the varied residents who made such places home.

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Exam 3. STUDY. PLAY. does NOT belong to the role of the poster during this period? A major figure in the development of modern design beginning in the.

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Chapter 5 : Montenegro - Wikipedia

That's not to say electrification couldn't someday play a role in long haul trucking. AEOS, the concept electric heavy-duty truck Cummins unveiled in , will help us learn about electrification's potential with larger vehicles traveling greater distances.

Web research, March A survey identified 36 university-based PoCCs operating in the U. Battery Industry for Electric Drive Vehicles: Progress, Challenges, and Opportunitiesâ€"Summary of a Symposium, op. Federal agencies partnering in this effort include the U. Proof of Concept Centers in the United States: Federal grants are provided on a matching basis. The Center features a prototyping design and development facility to accelerate commercialization, clean room facilities, and other equipment. It provides a broad array of services to medical device innovators, including design, engineering, product development, prototyping and small-scale manufacturing, preclinical testing, clinical trials, market research, and regulatory and quality assurance. It conducts research projects through contracts with companies, consortia, and universities. It has a long track record of fostering transformative technologies in computing, telecommunication microelectronics, the Internet and aerospace. DARPAâ€¦adopts a model that emphasizes intense short-term forays into uncharted territory beyond the recognized scientific frontier. These projects often fail, but when they succeed they can produce spectacular results. In recent years a number of policy organizations have begun to urge the federal government to make innovation clusters a fundamental aspect of its economic development policies. The Obama administration initiatives in the area include: The first provides existing clusters with funding for business training, commercialization and transfer services, and other services to support small businesses. The second focuses on clusters specializing in defense-related technologies to provide training, matchmaking, and business advice. In addition to investing in what it takes to build one job, we are investing in people who can create multiple jobs. The centers will feature a collaboration between companies, universities, and state, local and federal government agencies. The first center, the National Additive Manufacturing Institute, was established in August and will be located in Youngstown, Ohio. No other country in the world enacted comparable legislation until after World War II, and the great economic historian Alfred Chandler has observed that the Sherman Act and the values that it represented probably marked the most important noneconomic cultural difference between the United States and Germany, Britain, and indeed the rest of the world insofar as it affected the long-term evolution of the modern industrial enterprise. This entire industry, in which the United States is the clear leader, would have languished. Patent and Trademark Office, simplified and less costly litigation, harmonization of the U. Legislation enacted in which gave the universities the ability to secure patent rights on technology developed with federal government support has resulted in a dramatic increase in university-based innovation. At the end of World War II, the federal government was funding an extensive array of university-based research projects with the question of who had primary patent rights to research results being settled in a diversity of inconsistent ways. The magnitudesâ€¦are considerable and grow with geographical proximity to the university supporting the importance of spatial relationships in the spread of knowledge. Areas surrounding universities that received more federal research funding before the law was passed grow faster after the law than do others; the effect is particularly large for DOD and NIH funding. Locally-based industries must rely on the federal government to negotiate for and maintain their access to foreign markets. Government procurement contracts fostered the development of the U. Government purchases of ICs for these programs enabled U. Military demand could provide a market for U. A panoply of federal programs is now being directed toward the fostering of local innovation clusters, support for innovative start-ups, enhancement of U. Federal regulatory policies since in the realm of competition, intellectual property, and trade have played a critical role in stimulating innovation in the U. Growing Innovation Clusters for American Prosperity: Summary of a Symposium. The National Academies Press; Science and Engineering Indicators National Science Foundation; The relationship flourished and Goodyear now uses Sandia simulation tools to design many types of tires. Clustering for 21st Century Prosperity: Solar equipment maker Emcore acquired MODE, a company founded by Sandia scientists in to develop photovoltaic applications for satellites. As of , having grown substantially, it employed people. The Industrial Policy Debate. Harvard University Press; Industrial Competitiveness and Technological Advancement: Building the Illinois Innovation Economy:

Chapter 6 : Reimagining emerging market electric grids with blockchain | Deloitte Insights

UNDIPLOMATIC ACTION mental diplomacy has a role to play in shaping energy transitions, but a limited one. Nor does it require consistent national policy support. Indeed, most.

Emerging markets are attractive testing grounds, letting developers bridge financing gaps, enable transactions, and increase transparency. Introduction The power sectorâ€”in its electricity sourcing, production, and deliveryâ€”provides multiple opportunities to test blockchain technology. Across advanced economies, small businesses leveraging the technology are standing up microgrids in areas as dense as New York City, developing energy trading platforms in Tokyo and Australia, and driving supply chain efficiencies around the world. The two geographic areas that account for most of the global electrification deficitâ€”sub-Saharan Africa and India, which represent 57 percent and 25 percent, respectively, of the approximately 1. Can systems that lack some of the most fundamental of physical electrical assets, such as generation plants, substations, and transmission and distribution cables, effectively leverage an advanced technology such as blockchain? In emerging markets, governments and businesses can utilize blockchain to potentially advance the future of their gridâ€”a distributed, nimble, adaptive, and transparent networkâ€”by unlocking three functionalities: Bridging the financing gap Enabling energy transactions Unleashing radical transparency This article considers thought-provoking applications of the technology in both advanced and emerging economies, with potential implications for meeting electrification goals in the developing world. Development institutions and their stakeholders should be encouraged by the range of possibilities, and should consider blockchain as a foundational technology to enable future business processes. Blockchain, at its core, is a technology that can facilitate transactions, or any transfer of value. It is a transparent and shared transaction ledger that can substitute for centralized general ledgers in most current accounting systems. Rather than developing this ledger on a typical, centrally managed database software, the database or ledger is replicated across other devices and confirmed by its participants. Each transaction is broadcast to parties subject to the transaction as it occurs, and certain devices work to build consensus about, validate, and record the transactionâ€”after which it is irreversible see figure 1. To better understand the technical aspects of blockchain technology, please refer to Blockchain: Electrification is an expensive process that faces both physical and financial challenges, such as the installation of power lines and costs associated with generating and transmitting power. Developers need to recoup the money they invest; countries and generators that trade power need confidence they will be paid; and regulatory bodies that oversee the sector need transparency to monitor transactions. Blockchain potentially offers approaches to address these challenges. Bridging the financing gap While developers and financial institutions have advanced innovative approaches to financing power projects, capital remains scarce for generation assets in developing markets. The main reason for this scarcity is that developers need long-term 15â€”year power purchase agreements PPAs with creditworthy off-takers before they can obtain financing. In many developing countries, the off-takers are state-owned utilities, and, unfortunately for developers, capital markets do not typically consider these off-takers to be sufficiently creditworthy. As a result, development bank funds and donor guarantees buttress short-term development with the goal of improving utility creditworthiness over time. One innovative approach to expanding project financing sources is to allow local or international direct retail investors to purchase future energy production either for resale or direct consumption in the form of energy tokensâ€”providing discounted capital now for energy delivery once the projects have been developed. While WePower currently operates in Europe, its application may hold some promise for developing countries. The cost of trust The problem: There are real costs and risks associated with state-owned, vertically integrated power system operators in developing countries. When developers seek capital, financiers typically charge premiums to access funding based on the risk profile of those system operatorsâ€”premiums that may be prohibitively high, but are the cost of doing business in some markets. Can the power sector intermediary as institutional off-taker and capital markets be decentralized?

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WePower is testing this idea. Its model in a developing world context would allow retail investors to fund projects by purchasing its coin, and allow for a network of distributed holders of those coins to become direct ratepayers to the project, circumventing centralized market operators. For example, India has set highly ambitious renewable energy targets that would result in great quantities of variable renewable energy generation, but the addition may prove to be problematic for the grid in those regions in which intermittent wind and solar resources are likely to dominate. Cross-regional energy trading may alleviate the intermittency issue because it allows a region whose production has dropped to purchase power from another to cover that deficit. Smart contracts also offer an opportunity to automate the renewable energy certification process. The Indian Energy Exchange opened a market for Renewable Energy Certificates REC in , but requires state and central agencies to participate in the accreditation, registration, and issuance of RECsâ€"a time-consuming but necessary process. Smart contracts can not only automate this process, but also increase transaction speed, while creating an immutable record that supports REC authenticity and audit. In a blockchain ecosystem, state and central agencies would still govern and operate the system, but the smart contracts would facilitate more seamless and transparent transactions. Fighting variability with nimbleness The problem: Countries such as India are in the process of installing large quantities of variable renewable energy generation onto its still maturing grid. The additions add stress to existing grid operations, as unexpected dips in wind or solar production tend to require last-minute dispatch of conventional energy. Grids in emerging markets are often extremely regionalized. Enabling peer-to-peer energy transfer between regions to balance renewable energy ebb and flow can mitigate the stress variability causes. Smart contracts that leverage open-ledger production data offer one potential solution to help even variability and drive overall grid stability. Traditionally, microgrid developers often struggle to find an attractive return while providing reasonable electricity prices. Innovative entrepreneurs active in emerging markets are driving blockchain-based scalable solutions. Both LO3 and Power Ledger offer potentially promising new technology, but after proving the concept, they will need to champion regulatory reform, whether at state or provincial-level governments, such as in New York, or even nationwide in a country such as India. Further, Bankymoon enables its pre-paid meters to accept digital currency payments, which allows individual donors worldwide to pre-pay for electricity usage by Bankymoon-metered schools and other social institutions. Those payments are, in turn, settled automatically through blockchain-enabled smart contracts. The grid edge The problem: Extending electrification to the least served has been a persistent problem in many developing countries. Microgrids and solar home systems are rapidly becoming cost-effective. Solutions such as peer-to-peer trading can reduce operational costs with blockchain-enabled automated settlement; prepaid meters can be built to accept cryptocurrencies, widening the rate-paying base. Unleashing radical transparency In emerging market power sectors, opaque rule setting, poor compliance by utilities and other market participants, and insufficient regulatory oversight can deter investment. Where regulatory oversight is effective, costs of compliance can be a hardship for market participants. The uncertainty often leads project developers to demand high premiums for projects to move forward; many simply do not advance. Although currently as of mid there are no known use cases for blockchain-enabled regulatory reporting in the energy sector, financial services sector participants in Europe recently implemented a proof-of-concept called RegChain. Using RegChain, compliance procedures are automated for industry members and the processes and procedures are auditable by regulators. Strengthening regulatory oversight while driving better real-time response to power sector challenges could benefit citizens, power market participants, and investors alike across emerging markets. Shining a light The problem: The perception of corruption, arbitrary rulemaking, and the corresponding market and black-market costs of compliance seem to be some of the most oft-cited reasons for the lack of energy sector capital investment in emerging markets. Open ledger technology offers a radical view of what the future of regulatory oversight could look like: Transparent industry data on a blockchain and smart-contract-enabled automated compliance can lower both the cost of compliance and the risk of graft, opening these markets to greater investment. Stakeholders should keep in mind the following factors when considering developing country blockchain applications: In emerging markets, developers, utilities, operators, regulators, and customers often operate in an opaque system. While transparency and security represent a long-term net gain for all participants, that gain likely requires major short-term investment to establish the necessary level of cooperation to set up a blockchain-driven system. Designing with scale in mind: While blockchain solutions may provide value at all levels within the power sectorâ€”from microgrid to regional cross-border tradeâ€”broader blockchain applications will likely have greatest impact on existing systems that are already in place. Blockchain adopters will need to decide whether to develop lower-cost local or national systems that will require future integration into a larger regional framework, or incur the significant upfront cost associated with developing a comprehensive system that will work across borders and regions immediately. The historical spread of networking innovations suggests that local and national systems may develop before cross-border regional solutions. Some markets will recognize outsized value from blockchain solutions early; others will lag. Eventually both will likely integrate into regional systems; international development institutions should reflect this reality in their planning and build a vision of distributed ledger technology to support this transition. A continuing need for centralized utilities: Most countries envision a more nimble and distributed power grid, but the reality is that centralized utilities will likely continue to meet most electricity needs. Centralized utilities should explore how blockchain solutions can benefit them before they agree to advance IT modernization, train staff, and invest in IoT technologies required to implement blockchain. Centralized utilities are increasingly vulnerable to catastrophic cyberattacks; the December Ukrainian power grid hack provides a sobering example. Successful blockchain solutions could incentivize utility participationâ€”along with that of other market stakeholdersâ€”and demonstrate the potential for utilities to streamline operations and reduce costs. Potential investors may be skeptical of applying a nascent technology such as blockchain in an emerging market power sector context when it has not yet found widespread applicability in more sophisticated power markets. That skepticism, however, is likely informed by the traditional notion of an optimal power marketâ€”featuring centralized administrators and clearing houses dispatching power from base load assets requiring year fixed investments. Forward-thinking venture capital investors, along with financial institutions with a development mandate, could re-envision this status quo and leverage the opportunity in unbuilt environments to test what a more decentralized, nodal, cleaner, and networked grid might look like, and more specifically, which pilot projects might advance this vision. These challenges notwithstanding, blockchain appears to have the potential to help overcome obstacles that keep millions of people in the dark worldwide. To get started, development practitioners can chart out an implementation road map to help solutions grow in scope, scale, and complexity for more details, read Blockchain to blockchains: Broad adoption and integration enter the realm of the possible. As this article illustrates, blockchain power sector applications seem nascent in all markets, including emerging markets, with many more opportunities likely to come. Development institutions should engage developers, utilities, operators, regulators, and customers broadly to help understand where business challenges can be disrupted by blockchain solutions, and build an entrepreneurial environment that can deliver more impact, for lower cost, at a sustainable scale. As the first solutions reach market, the role of international development institutions could change from building local capacity and understanding to establishing a sustainable enabling environment along with advancing solutions that align with development goals. Providing support through pilot tracking, collaboration on standards, and retrospective analysis can provide early entrepreneurs with access to essential data and training to make informed decisions, as well as an understanding of the nontechnical components required to successfully deploy a blockchain application. If and when pilots have proven the technology, it will be time to grow. Here international development institutions could be well-positioned to provide value in establishing consortia across the power sector with robust membership, leadership, funding, and governance given their penetration in emerging market power sectors. With their intervention, blockchain has the potential for tremendous impact on bridging the financing gap, enabling energy transactions, and unleashing radical transparency in the power sector. She is based in Arlington, Virginia. He is based in Arlington, Virginia.

Chapter 7 : Sectors & Services â€“ Atkins

Is there a role for government in the economy? Yes, says Heritage analyst Karen Campbell--but the government must focus on maintaining economic stability.

Shutterstock Bukhavets Mikhail Replacing tens of thousands of problematic chemicals in global marketplaces is a Herculean effort. The European Union is far ahead of the United States in terms of legislative mandates that restrict the use or require substitution of highly hazardous chemicals. How well are EU governments and companies doing to develop safer substitutes, and how does their investment of resources and capacity building compare to the U. The European Chemicals Agency ECHA commissioned the Lowell Center for Sustainable Production at the University of Massachusetts to conduct an assessment of current capacity and needs to enhance support for the informed substitution of substances of very high concern in the EU. Our new report provides important lessons for federal, state and local government agencies and showcases areas where the U. If REACH â€" the primary chemicals management legislation in the EU â€" as well as a long list of directives, regulations and member state policies are to support the transition to safer alternatives for substances of very high concern, the following investments are critical: Greater infrastructure in government "Member State Authorities" capacity 2. Enhanced collaboration within supply chains and among Member State Authorities to address substitution challenges 4. Improved technical resources and assistance. How does the U. Agency resources supporting substitution: Both the EU and the U. Despite substitution being near the top of the hierarchy of hazard control , it is not being elevated as a priority risk management option and resources among government authorities in EU and agencies here in the U. Of the 16 EU Member State Authorities surveyed, half have only one full-time equivalent staff dedicated to substitution. The same meager statistics are seen in the U. The primary pressure is being driven in large part by market demands and chemicals legislation in a handful of states. However, rather than a federal regulatory driver, the primary pressure is being driven in large part by market demands and chemicals legislation in a handful of states. Federal agencies have responded to these trends with innovative voluntary programs that incentivize companies to adopt safer substitutes, as there are far too many examples of substituting one hazard for another. However, similar to their European counterparts, U. However, these state programs are by far the exception rather than the rule. Similar to their European counterparts, US federal agencies remain tremendously under-resourced in their work to promote and support industry substitution efforts. The implementation of both the Frank R. Yet as seen in the EU, such regulatory drivers need to be coupled with resources for agencies to support the broader range of needs and challenges beyond the regulatory realm. To move towards a production economy based on using safer chemicals, government agencies will need to continue to play an important non-regulatory role in supporting investment, the facilitation of supply chain collaborations around safer substitutes and technical capacity building. Existing infrastructure and resource needs will undoubtedly limit forward momentum on these fronts. Supporting investment in safer alternatives Government plays an essential role in facilitating and supporting innovation development, adoption and diffusion towards safer chemicals. However, our assessment found a clear disconnect between regulatory priorities and technology and research funds that support safer chemistry development and adoption. Such a disconnect is also present in the U. Yet these are largely disconnected to priority hazardous chemicals of concern and associated regulatory priorities. It is critical that early signals be provided to the marketplace on substances of potential concern to initiate innovation. Moreover, major funding initiatives, such as the National Manufacturing Initiative Institutes, make little or no mention of safer chemistry. The Green Chemistry and Commerce Council is undertaking a landscape analysis of federal funding initiatives that are or could be directed towards safer chemistry as a starting point to provide outreach to such agencies. Research on and development of safer alternatives to priority chemicals of concern needs to occur far in advance of regulatory risk management reviews in order for agencies to justify the restriction of known carcinogens and other highly toxic chemicals.

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Enhancing supply-chain collaboration research The need for enhanced industry and supply-chain engagement on both technical and non-technical aspects of substitution was a key finding in our EU capacity assessment. For example, significant gains in supply chain collaborations in the building sector, textiles and footwear sectors as well as healthcare sector have been made in both the EU and the U. Yet these efforts need to be scaled and replicated across the range of industry sectors dependent on the use of highly hazardous chemicals. Enhancing technical capacity Alternatives assessment, and other science policy and technical fields to support chemical substitution, are relatively new. While there is extensive technical knowledge in industry on chemical processes, there may be less particularly among smaller enterprises on technical options for substitution, including expertise for alternatives assessments. Expert networks on substitution and alternatives assessment are critical to support regulatory drivers, yet these networks are relatively absent in the EU. Several training programs on alternatives assessment have emerged out of these efforts, including a new OSHA worker training program. There is a clear need and opportunity to expand these expert networks to the EU. Moving forward a safer U. A primary lesson from our review of substitution capacity needs in the EU is that regulations alone are necessary, but insufficient to enhance the evaluation, adoption and diffusion of safer alternatives. As we remain focused on advancing new regulatory opportunities to phase out highly hazardous chemicals in the U.

Chapter 8 : Strategic Decision Making in the Information Age

Cummins believes it has the manufacturing expertise and service network to quickly play a leading role in the electrification market. While pleased with the test so far, Viola is reluctant to predict just when much of Purolator's fleet will be electrified.

Other factors in the constitutional changes were continued Hungarian dissatisfaction with rule from Vienna and increasing national consciousness on the part of other nationalities or ethnicities of the Austrian Empire. However, dissatisfaction with Austrian rule had grown for many years within Hungary and had many other causes. By the late s, a large number of Hungarians who had supported the â€”49 revolution were willing to accept the Habsburg monarchy. They argued that while Hungary had the right to full internal independence, under the Pragmatic Sanction of , foreign affairs and defense were "common" to both Austria and Hungary. The new foreign minister, Count Friedrich Ferdinand von Beust , wanted to conclude the stalemated negotiations with the Hungarians. Kriegsmarine War Fleet and, during the war, the k. There were three k. All other state functions were to be handled separately by each of the two states. This split had to be negotiated every decade. By , the Hungarian share had risen to The common army changed its label from k. In the Kingdom of Croatia and Slavonia , its autonomous institutions hold k. In this sense Austria-Hungary remained under an authoritarian government, as the Emperor-King appointed both Austrian and Hungarian Prime ministers along with their respective cabinets. This made both Governments responsible to the Emperor-King, as neither half could have a government with a program contrary to the views of the Monarch. The Emperor-King could appoint non-parliamentary governments, for example, or maintain in power a government which does not have a majority in Parliament to block the formation of another which he does not approve. The Monarch had other prerogatives such as the right of Royal Assent before any kind of Bill would be presented to the National Assembly the common name for the Hungarian Diet , the right to Veto all legislation passed by the National Assembly, and the power to prorogue or dissolve the Assembly and call to new elections he had the same prerogatives considering the Croatian-Slavonian Diet or Croatian Parliament, the common name for the Croatian-Slavonian Diet. However, the ministers ultimately answered only to the monarch who had the final decision on matters of foreign and military policy. Overlapping responsibilities between the joint ministries and the ministries of the two halves caused friction and inefficiencies. Although the unified government determined the overall military direction, the Austrian and Hungarian governments each remained in charge of recruiting, supplies and training. Each government could have a strong influence over common governmental responsibilities. Each half of the Dual Monarchy proved quite prepared to disrupt common operations to advance its own interests. Under the terms of the "Austro-Hungarian Compromise of ", an agreement renegotiated every ten years, determined these matters. There was political turmoil during the build-up to each renewal of the agreement. The disputes culminated in the early s in a prolonged constitutional crisis. It was triggered by disagreement over which language to use for command in Hungarian army units, and deepened by the advent to power in Budapest in April of a Hungarian nationalist coalition. Provisional renewals of the common arrangements occurred in October and in November on the basis of the status quo.

Chapter 9 : Program | GreenBiz

The Role of NGOs and Civil Society in Global Environmental Governance Barbara Gemmill and Abimbola Bamidele-Izu summary This chapter identifies five major roles that civil society might play in.

Robert Bob Koger on his 30th anniversary at Advanced Energy! In honor of this big milestone, we spoke to Dr. Koger about his three decades at Advanced Energy and his experiences, memories and highlights. When you first arrived at Advanced Energy, the site of the organization was basically all office space, but that changed a few years later. We helped launch the Industrial Electrotechnology Laboratory IEL in the early s as a way to extend our efforts and capabilities. It was located on N. It primarily acted as a problem-solving center for industries, and focused on promoting electrotechnologies such as infrared dying, powder coating and radio frequency drying and motors. Industry members could try out the equipment and receive in-plant testing. Over the years, the IEL refined its scope, and today it is known as our electric motor and drive testing lab. Motors and drives from all over the world are shipped to us to be tested and certified for durability, safety and efficiency. Additionally, in the last two decades our industrial fieldwork has flourished. Our energy assessments and audits help industrial facilities improve energy efficiency, save money and reduce their carbon footprint. In addition to the development of the IEL, Advanced Energy has managed a ton of influential projects and programs during your time here. This was a unique undertaking early on in your career at Advanced Energy â€" can you explain how it worked? Typically, farmers would use giant refrigerators to cool produce immediately after harvesting, but this approach added significant demand to utilities, especially during summer peak periods. The iceberg was different because it could run year-round and help spread out load. It was developed in an ,gallon underground tank, and icemakers would fill the tank with millions of pounds of ice. The steady amount of electricity drawn throughout the year prevented utilities from being faced with a big load all at once. Can you talk a little about how it got started? In the early s, the N. They asked the N. Utilities Commission to consider whether a checkoff program on utility bills would be effective. The Commission requested that we take the lead on investigating which options would be best for developing a green pricing program, and we convened stakeholder meetings with representatives for consumers, electric utilities, the environmental community, technology experts, the State Energy Office and regulators. After two years of discussions, in , NC GreenPower officially launched as a nonprofit subsidiary of Advanced Energy to promote renewable energy sources in North Carolina. It was the first independent, statewide, multi-utility green pricing program in the U. Through voluntary contributions, the organization helps make solar, wind, landfill methane, small hydro and biomass projects feasible and has supported more than 1, projects across North Carolina since its founding. In , NC GreenPower launched its Solar Schools pilot program , an educational initiative that provides grants for the installation of small solar photovoltaic arrays at North Carolina schools. NC GreenPower Solar Schools also supplies a weather station, real-time monitoring equipment, a curriculum and educational training for teachers, making it a true hands-on solar experience for students. By the end of , the program will have reached 27 schools in 22 counties, bringing solar and energy education to more than 23, students. Alongside the work being carried out by NC GreenPower, Advanced Energy has had significant success supporting the solar industry in other ways. Even before I arrived at Advanced Energy, we were helping promote awareness and understanding of solar power through workshops and research projects. However, our solar offerings really blossomed in the last several years, as the technology started to grow in the market more broadly. Today, we provide a mix of off-site and on-site evaluations to ensure that solar projects are installed to quality standards, provide optimal performance and can be maintained for safe and reliable operation for the life of the system. Our recent work in interconnection commissioning makes sure that independent power producer facilities that are interconnected to the utility grid comply with necessary documentation, codes and standards. Similar to solar technology, electric vehicles have gone through varying trends in the market, with an especially strong push recently. We began researching the potential of electric transportation decades ago, long before it really started to catch on in full. Soon after I arrived, we invested in an electric van to assess its feasibility in commercial fleets. A couple of years later, we converted a Pontiac Fiero to run on batteries and took it on highway trips to help study how these vehicles could affect utility loads. Since those early days, our transportation work â€" along with the market â€" has only grown. In the early s, we managed a decade-long project examining plug-in hybrid electric school buses to evaluate operating costs, emissions, fuel economy, and other benefits and limitations. More recently, we have been partnering with electric co-ops to help them and their communities prepare for the progression of electric transportation. We also launched Plug-in NC , a statewide initiative to promote electric vehicles through education, outreach and resource development. So do you see yourself in an electric car one day? I have decided that my next car will either be a plug-in hybrid or hopefully an all-electric. However, before I go with an all-electric, I would want to see a significant increase in the number of public charging stations in the country. I expect it to be a plug-in hybrid with at least 50 or 60 miles on battery alone. How about in the residential sector? Advanced Energy has made a big impact on this market, particularly in the realm of low-income housing. Our low-income residential work was spurred in large part by the devastation of Hurricane Floyd in , which destroyed thousands of homes. We initially participated in the Build Back Better Campaign, and this ended up transitioning into our SystemVision program , launched in This collaboration has resulted in the construction of more than 5, high-performance, energy efficient, affordable homes in North Carolina. In addition to the support of the NCHFA, we rely on a network of nonprofit builders and countless volunteers who ensure that every home is well-built and meets our standards, as well as raters who inspect the homes throughout the process. In another residential exploration that took place primarily in the mids, we received a federal research grant to study closed crawl spaces. Our research led to the finding that these crawl spaces, which are insulated spaces without vents to the outside, can significantly improve moisture control and energy efficiency. With the help of this research, closed crawl spaces are now the standard for LEED homes and easier to install through the North Carolina building code, and other states have made similar changes to their codes. I even closed my own crawl space after this work! Along with your involvement in many of the projects and programs that Advanced Energy has delivered, you also have 30 years of participating in our fun and educational! For example, we at Advanced Energy have been fortunate to have had many notable guest speakers at staff and board meetings. We have had a remarkable history of having outstanding speakers make presentations to our board and staff throughout my time at Advanced Energy. It is difficult to limit myself to identifying a single speaker, but a couple of years ago, we had the chairman of Net Power talk to us. He described a remarkable new way to build a natural gas generator that needed no water to operate, could be built at the equivalent cost of a regular gas generator and would be carbon-free in terms of its output. They have just completed a successful prototype of such a plant in Texas. This could be a world changer in terms of helping in our fight against global warming, as such a plant could help back up solar and wind generation until battery storage becomes more economical. Have any made a lasting impact on your career? I have been involved with many professional groups during my career. However, the Electric Power Research Institute EPRI meant the most to me in terms of staying current on the many issues related to energy production and usage. As a commissioner at the N. Can you tell us about a favorite memory from one of these gatherings? I have enjoyed all of the yearly staff training retreats. In addition to the excellent information that we have gotten from various expert trainers that we have hired, it has been an opportunity to get to know individual employees on a more personal basis through the different educational games they lead us through. I remember being dropped to the ground accidently, I think by my team when we were involved in some contest with other teams. Fortunately, the holidays are usually an equally fun and less potentially harmful time at the office. Several years ago, I got Superman pajamas that actually turned out to be my size. However, everyone usually has a good time laughing at these parties. I think we have had a significant and positive impact in North Carolina and actually the nation in terms of promoting energy efficiency for all types of users. We have received numerous federal grants to work on energy-related matters, done a lot in the promotion of renewables through our subsidiary, NC GreenPower, and made an impact in various areas of research and testing, such as with electric motors, electric vehicles and crawl spaces, as mentioned earlier. To wrap us up, what would you like Advanced Energy to look like in the next 30 years? I think Advanced Energy needs to continue to make sure its employees are well-informed, trained and educated on all of the developing and significant innovations being studied that are related to the energy industry. Of course, it is difficult to predict what breakthroughs in the field of energy will occur in the future. I know when we established our NC GreenPower subsidiary in , solar photovoltaics were very expensive, and in the last 15 years, costs of solar panels have decreased by a huge amount. Will they continue to decrease? Will battery storage become affordable for all classes of customers so that more intermittent solar and wind can be made reliable on a localized hourly and daily basis? Will fuel cells become more feasible? Will we embrace electric vehicles as fully as many people expect? Also, from a usage side, there is still much that can be done regarding energy efficiency. Given that we are all generally concerned about global warming, the more efficient we are and the more carbon-free and hopefully cost-effective generation we embrace, the better. I think that Advanced Energy can play a significant role in these areas over the next 30 years. I also expect to see a continuation of Advanced Energy being awarded federal research grants given our reputation for past work. In regard to staff size, I have seen our staff more than double during the last 30 years, and I believe it will double again in the next 30 years. The energy industry has certainly changed over the last three decades, but Dr. Koger has been there to guide Advanced Energy through every new development, technology and challenge that has surfaced. Please join us in congratulating him on this year achievement!